National Aeronautics and Space Administration

NASA's **Aeronautics Test Program**

Support Aircraft

When the aviation, space, and science communities want to pursue innovative solutions for high-priority needs, they look to the Neil A. Armstrong Flight Research Center's support aircraft fleet to deliver effective results in an ever-changing, sometimes unpredictable environment. Our mission support aircraft are flexible, adaptable, and agile platforms that are real-time in-situ research facilities to collect, process, exploit, and disseminate the best research data possible, as quickly as possible to demonstrate technologies and concepts, in the toughest environments.

These assets are key to improving the confidence level of space-based programs for the ascent, in-flight, and descent phases through the atmosphere. These aircraft are also vital in performing risk reduction in a real-world environment, in which instruments and other equipment are accessible real time for repair.

Support of Space-Based Technologies

A recent example of how Armstrong's aircraft supported space-based activities is seen through the partnership with NASA's Jet Propulsion Laboratory on the **Mars Science Laboratory (MSL)** mission, part of the Mars Exploration Program. An Armstrong F/A-18 carried a Quick Test Experimental Pod that housed the MSL test radar attached underneath the aircraft's left wing. The F/A-18 climbed to 40,000 feet, then made a series of subsonic, stair-step dives at angles of 40 to 90 degrees to simulate what the MSL's radar would see during entry into the Martian atmosphere. These tests helped prove the viability of suborbital flight-testing of critical space hardware and allowed a unique opportunity to test equipment in a representative environment prior to the space flight hardware blasting off to Mars.

The F/A-18 can also fly for extended periods of time, so the low-cost, quick-schedule tests can be conducted back-to-back, making small changes between each one to compare the results. Should there be an in-flight anomaly, the pilot can turn the experiment off and fly the airplane back to base.

Armstrong's mission control rooms were also fully utilized, providing monitoring of on-board instrumentation and downlink of in-flight MSL radar operation telemetry and video from chase aircraft and ground-based long-range cameras.

F/A-18 No. 852 performs a roll during a dive toward Rogers Dry Lake at Edwards AFB with the MSL landing radar under its left wing as part of the radar's verification and validation flight tests.

Hannah Goldberg, a NASA JPL engineer on the Mars Science Lander field test team, checks out the MSL radar in the Quick Test Experimental Pod on NASA Armstrong's F/A-18 aircraft.

Characteristics

Support Aircraft	F-18	F-15D	T-34C	B200 King Air
Seats	(2) two-seat and 2 single-seat	2 seats	2 seats	11 (includes crew)
Manufacturer	McDonnell Douglas	McDonnell Douglas	Raytheon Aircraft Co.	Beech Aircraft
Engine	Two GE F404 turbofans; 17,700 lb of thrust	Two P&W F100 axial-flow turbo-fans; 23,450 lb of thrust (each engine)	550-hp PT6A-25 turboprop	Two 850-hp PT6A-42 turboprop
Top Speed	Mach 1.7 (1190 mph)	Mach 2.5	280 kts	292 kts
Wing span	40 ft, 4 in	42.83 ft	33 ft, 5 in	54 ft, 6 in

Safety Chase Support

While performing safety chase support, pilots maintain rebroadcast hot-mike and constant radio and visual contact with research test vehicles to ensure total flight safety during specific tests and maneuvers. The chase pilots monitor external flight-critical safety items, clear other aircraft operations, observe flight-control operations for the test pilot, and can provide additional real-time feedback to the test pilot and control room personnel. A recent example of how Armstrong's aircraft supported space-based activities is seen in the **Launch Vehicle Adaptive Control (LVAC)** experiment, in which an F/A-18 provided crucial testing for NASA's Space Launch System flight control system by simulating various flight conditions.

Chase plane support was required to accomplish one of the four objectives of the LVAC experiment. While the project desired to have chase for all test points, it was critical during maneuvers in which the pilot manually controlled the simulated ascent trajectory. Each trajectory started at 19k feet, peaked at 30k and finished back around 19k. The chase pilot followed the test aircraft through this trajectory and maintained traffic awareness and ensured clear airspace for a safe maneuver. During these manual steering test points, the LVAC pilot was focused on a cockpit trajectory guidance display and could not maintain adequate out-the-window situational awareness.

Stratospheric Observatory for Infrared Astronomy (SOFIA) with an F/A-18 chase plane.

T-34C

B200 King Air

Photo and Video Support

Two-seat support aircraft are used for photo and video support. Photo and video technicians in these aircraft transmit live video back to control rooms so that project engineers can monitor the mission as it is flown ensuring the ability to make critical flight safety decisions if required. This capability greatly enhances existing ground-based long-range optic systems providing video and photo recording of research flight-test accomplishments.

F/A-18's

F-15D

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